APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/973,148	10/08/2001	Tetsuo Ogino	0015208 (145)	5598

7590 12/03/2004	EXAMINER
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ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 12/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	09/973,148	OGINO, TETSUO
	Examiner	Art Unit
	Anthony Mackowey	2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/08/01*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *37-60* is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *37-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☒ All   b)☐ Some * c)☐ None of:

     1.☒ Certified copies of the priority documents have been received.

     2.☐ Certified copies of the priority documents have been received in Application No. _____.

     3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
   Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 37-60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 37, 46,55 and 58, recite:

"maintaining or enhancing pixel value of said pixel of interest when said determined variance is significantly larger than a variance of noise, otherwise suppressing or maintaining said pixel value of said pixel of interest."

It is unclear which alternative actions taken correspond to one another if the determined variance is/ is not significantly larger than the variance of noise.

The term "significantly larger" in claims 37,46,55, and 58 is a relative term which renders the claim indefinite. The term indicated is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The specification discloses that the decision as to whether the determined variance is significantly larger than the variance of noise is made using a ratio of the variances compared to a threshold value. The threshold value is disclosed as an appropriate value greater than one. It is understood that a threshold value greater than one would make the determined variance larger than the variance of noise, however, without some indication as to how an appropriate threshold value is determined, it is unclear what constitutes the determined variance being sufficiently larger than the variance of noise.

Claims not mentioned specifically depend from indefinite claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign
country or in public use or on sale in this country, more than one year prior to the date of
application for patent in the United States.

Claims 37, 40-43, 46, 49-52 and 58 are rejected under 35 U.S.C. 102(b) as being

anticipated by U.S. Patent 5,038,388 to Song.

As to claim 37, Song discloses an image processing method comprising the steps of:

determining a variance of pixel values in a local region to which a pixel of interest

belongs (col. 8, lines 49-54), wherein each pixel constituting an image is defined as said pixel of

interest (col. 6, lines 66-68; col. 9, 37-40); and

maintaining or enhancing said pixel value of said pixel of interest when said determined

variance is significantly larger than a variance of noise, otherwise suppressing or maintaining

said pixel value of said pixel of interest (col. 10, lines 32-50).

The use of "or" between two limitations only requires the prior art to meet either one of

the two limitations. In this case, Song enhances said pixel value of said pixel of interest when

said determined variance is significantly larger than a variance of noise, otherwise maintaining

said pixel value of said pixel of interest.

With regard to claims 40 and 41, these claims further specify the limitation of

suppressing pixel value as disclosed in claim 37, however the examiner has chosen to address

the alternative limitation (maintaining pixel value) disclosed in claim 37. Therefore, these claims

will not be discussed.

As to claim 42, Song further discloses enhancing of said pixel value is performed by

multiplying by a coefficient which is equal to or greater than one (col. 10, lines 17-31).

As to claim 43, Song further discloses enhancing of said pixel value is performed by

adding a predetermined numeric value (col. 10, lines 32-44).

As to claim 46, Song further discloses an image processing apparatus (col. 6, lines 66-

68 and col. 7, lines 1-52). Regarding the remainder of the claim refer to the previous discussion

of claim 37 above.

As to claims 49 and 50, arguments analogous to those presented above for claims 40

and 41 are applicable to claim 49 and 50.

As to claims 51 and 52, arguments analogous to those presented above for claims to 42

and 43 are applicable to claims 51 and 52 respectively

As to claim 58, refer to the previous discussion of claim 46 above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or
> described as set forth in section 102 of this title, if the differences between the subject
> matter sought to be patented and the prior art are such that the subject matter as a
> whole would have been obvious at the time the invention was made to a person having
> ordinary skill in the art to which said subject matter pertains. Patentability shall not be
> negatived by the manner in which the invention was made.

Claims 38, 45,47, 54-57 and 59 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Song in view of U.S. Patent 6,043,655 to Makita et al ("Makita").

As to claim 38, Song discloses all the limitations of claim 37 and the step of maintaining or enhancing pixel value provides adjustment of pixel values (col. 10, lines 18-50).

Song does not disclose that each pixel constitutes multi-slice images or the step of performing maximum intensity projection on said multi-slice images subjected to said pixel value adjustment. However, Makita discloses pixels constituting multi-slice images and also discloses performing a maximum intensity projection on said multi-slice images subjected to pixel value adjustment (col. 5, lines 54-67; col. 6, lines 1-3).

The teachings of Song and Makita are combinable because they are both image processing methods concerned with manipulating pixel values and reducing the significance of noise in the image. Makita's technique would allow enhancement of multi-slice images, extending the applicability of Song's method into other areas of imaging such as medical imaging. Performing maximum intensity projection provides the additional advantage of improved visibility and distinguishability of various structures in the image (Makita, Col. 2, lines 8-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Song and Makita.

As to claim 45, Song does not disclose the image is of a blood flow image. However, Makita discloses an image processing method in which the images are of blood flow (col.2, lines 8-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the image processing method of Song to a blood flow image as taught by Makita, which would result in improved visibility and distinguishability of blood vessels from noise and other tissue in the blood flow image (Makita, col. 2, lines 8-13).

As to claim 47, arguments analogous to those presented above for claim 38 are applicable to claim 47.

As to claim 54, arguments analogous to those presented above for claims 45 are applicable to claim 54.

Claims 55-57 are rejected because the preamble of claim 55 is worded such that the intended use of the recording medium is disclosed, but does not require the functions disclosed in the claims be performed. The preamble merely sets forth an intended use of the recording medium.

It is suggested that the preamble of claim 55 be reworded as follows:

A computer-readable medium having recorded thereon computer executable instructions for causing a computer to implement the functions of:

Also regarding claim 55, Song does not disclose a recording medium for being recorded in a computer readable manner with a program. However, Makita discloses a controller (which includes a computer) that has the function of following a procedure that is a software program stored in the computer (col. 4, lines 66-67; col. 5, line 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Song and Makita. It is well known that computers are commonly used to perform complex and repetitive mathematical calculations inherent in image processing methods because of their flexibility, speed and cost efficiency compared to hardware implementations of the calculations. Although Makita is silent as to what form of storage medium within the computer the software program is stored, however, it is well known that hard drives and RAM are the most common storage devices in computers (Official Notice). As to the remainder of the claim, refer to the previous discussion for claim 37.

Also regarding Claim 56, arguments analogous to those presented above for claim 38 are applicable to claim 56.

As to claim 59, arguments analogous to those presented above for claim 38 are applicable to claim 59.

Claims 44 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song in view of U.S. Patent 6,256,403 to Florent et al ("Florent").

Song discloses all the limitations of claim 37 and teaches of a variance of noise (col. 9, lines 62-66) but is silent with regard to the steps of:

determining a residual sum of squares of pixel values for each of a plurality of local regions defined over an entire image;

determining a histogram of said residual sum of squares; and

determining said variance of noise based on a residual sum of squares that gives a peak of said histogram.

Florent discloses finding the standard noise deviation for each of a plurality of local regions defined over an entire image. (col. 4, lines 17-27; Equation 5a); and

determining a histogram of said standard noise deviation; and

determining the maximum standard noise deviation based on the peak of said histogram (col. 5, lines 41-57).

Florent also discloses that the standard noise deviation is calculated as the square root of the noise variance (col. 4, lines 26-27).

It can be seen in Equation 5a that the residual sum of squares is a component of the standard deviation calculation. The variance of noise is merely the square of the maximum standard noise deviation. Such statistical relationships are well known, trivial and would have been obvious to one of ordinary skill in the art. Motivation for performing these mathematical modifications would be to compare like terms (i.e. variance to a variance instead of a variance to a standard deviation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings to combine the teachings of Song and Florent as they both image processing methods concerned with reducing the significance of noise in the image. One of ordinary skill in the art would have been motivated to include the method for finding the variance of noise as taught by Florent in the image processing method taught by Song because one must know the value of the variance of noise in determining whether the determined variance is significantly larger than the variance of noise, then performing the corresponding pixel manipulations, thus enhancing the image.

As to claim 53, arguments analogous to those presented above for claims 44 and are applicable to claim 53.

Allowable Subject Matter

Claims 39, 48 and 60 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 6,718,068 to Gindele et al discloses identifying a pixel of interest and removing noise from a digital image. U.S. Patent 4,761,819 to Denison et al discloses determining the variance of pixel value and the variance of noise in an image. U.S. Patent 5,933,540 to Lakshminarayanan et al discloses a filter system to suppress noise in a digital image.

Contact information

Any inquiry concerning this communication or earlier communications from the examiner

should be directed to Anthony Mackowey whose telephone number is (703) 306-4086. The

examiner can normally be reached on M-F 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private

PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AM
11/9/2004

Jon Chang
Primary Examiner